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INDUSTRIAL AND CIVILIAN CONSUMPTION OF LIQUID FUELS AND LUBRICANTS IN AXIS EUROPE DURING 1943

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INDUSTRIAL AND CIVILIAN CONSUMPTION OF LIQUID FUELS AND LUBRICANTS IN AXIS EUROPE DURING 1943

SUMMARY

The drain on Axis oil stocks caused by a Russian campaign of avowedly miscalculated length and intensity has been halted in 1943. A near balance between current supplies and consumption has been achieved, principally through the drastic reduction of industrial and civilian demand, but also through the increased production of synthetic petroleum and through the greater use of substitutes. To achieve this near balance, allocations to civilian usages in 1943 had to be reduced below the 1942 level, not only in those few cases where, due to local conditions of supplies (Hungary and Rumania), some cushion for further savings actually still existed, but also where savings could only be effected by drastically cutting into essential consumption.

The estimated industrial and civilian consumption of liquid fuels and lubricants in Axis Europe in 1943 amounted to 6,430,000 metric tons, or about two-fifths of total Axis European production. This excludes gaseous and solid substitute fuels which were used in an amount equivalent to 1,300,000 tons of liquid fuel. (See Summary Tables I to V). Consumption was reduced by almost four-fifths from the 1938 level. The brunt of the curtailment of the petroleum supply has been borne by the conquered and occupied countries. The scale of reduction was about 60 percent among Axis combatants but more than 94 percent in conquered countries.

Industrial and civilian consumption of petroleum products is strictly limited according to the importance of each use in the Axis

war effort. Outside Occupied Russia agricultural and railway uses have been reduced least, while road transport and bunker shipping have suffered the greatest cuts. Private motoring has been eliminated and severe restrictions have been imposed on commercial motor traffic. The cessation of overseas shipping has permitted a great reduction of bunker oil consumption. Supplies to inland and coastal shipping have been cut by three-fifths to two-thirds and supplies to industry have undergone a similar decline. Household consumption has declined to one-third of its pre-war level. Among the various products, light motor fuel consumption has fallen most (79 percent), while consumption of gas and fuel oil has declined by three-fourths and of kerosene by about three-fifths. Lubricating oil consumption, which is only 37 percent below the 1938 level, has been reduced least.

The estimates exclude gaseous and solid substitutes which were used in an amount equivalent to 1,077,000 tons of light motor fuel and 228,000 tons of gas oil. More than two-fifths of the fuel demands of road transportation were met by such substitutes.

There is at present no margin left between actual civilian allocations and the supplies urgently needed to maintain transportation, to move goods from railway stations and ports, to operate inland shipping, to run the railroads, to till the soil, and to keep the wheels of industry turning. Beyond doubt the reduction of oil supplies has already slowed down essential production and transportation.

Although the 1943 allocations are close to the "hard core" of civilian requirements, the size of such requirements is not rigid. Emergency measures of reorganization and substitution initiated in 1942 and 1943 are becoming effective and will cause a reduction of essential

requirements for liquid fuels in 1944. In particular, conversion of private cars and light trucks to substitutes will allow some further savings of liquid motor fuel in 1944. Gradual slight incursions upon the non-military uses of petroleum products, especially in Rumania and Hungary, can still be made without immediate repercussions on military activity. Such incursions do impose, however, a cumulative limitation on the over-all output of the economy. The consequence of insufficient oil supplies in an economy constantly being adjusted to oil-deficiency is not a dramatic "breakdown" but a gradual process of attrition.

In addition, the growing disintegration of "Festung Europa" and the slow decay of the Axis economy will allow certain gains on the Axis oil balance sheet in the form of reduced requirements. The most important increments will result from the loss of conquered territories in Eastern, Southern, and probably Western Europe, which will no longer have to be provided with petroleum products. The aerial destruction of Axis towns and production facilities and the ensuing decline of industrial output will also tend to reduce oil consumption for productive purposes, though this trend will in fact be counterbalanced by the higher requirements of an economy which must cope with cumulative disorganization and disruption. On the basis of these complex considerations, it may be concluded that the annual rate of industrial and civilian consumption of liquid fuels and lubricants will probably be cut by 300,000 tons in the first six months of 1944 and by a total of 800,000 tons during the year.

The estimates of industrial and civilian consumption of liquid fuels and lubricants in Axis Europe in 1943 presented in the appended tables are based so far as possible on the known or estimated

number of oil using machines in each branch of the economy as of July 1943, and on the estimated rate of activity within each country. Where detailed information was not available, 1943 requirements by uses have been estimated on the basis of the 1938 consumption pattern, allowing for changes in the rate of activity and for substitution. The priority granted to the various countries (and to the various uses within each country) depends on their contributions to Germany's war effort and their own petroleum position. These considerations were the subjective bases of those estimates for which quantitative intelligence was lacking.

A detailed statement of the considerations governing each estimate is presented in the following pages. The study is largely based on the OSS report on "Industrial and Civilian Consumption of Petroleum Substitutes in Axis Europe in 1942". Some intelligence used in the 1942 study had to be re-evaluated in the light of more recent events and a few corrections of the estimates, especially in the case of Germany, became necessary.

The 1942 OSS study dealt with both the civilian consumption of liquid petroleum products and the development of gaseous and substitute fuels. For reasons of expediency and also to assure comparability with the American estimates of supplies and the British Hartley report, two separate studies have been prepared for 1943: the first deals with "Civilian Consumption of Liquid Petroleum Products in Axis Europe, 1943" and the second with "The Use of Substitute Fuels in Axis Europe, 1943". The first study refers to all liquid fuels and lubricants obtained from the refining of crude oil and by synthetic production

from coal (including bottled or liquid gas). It also includes the consumption of power alcohol, motor benzol, vegetable and animal oils used as lubricants or motor fuel, and the liquid output from tar oil distillation if and when used to replace liquid petroleum products. An allowance for the consumption of liquid petroleum products by substitute fuelled motors has also been included. The study of substitutes refers to all gaseous fuels (except liquid gas) and solid fuels used to drive internal combustion engines.

TABLE I

ESTIMATED INDUSTRIAL AND CIVILIAN CONSUMPTION OF LIQUID FUELS AND LUBRICANTS IN AXIS EUROPE, 1943[1]

Breakdown According to Countries and Products

(Thousand metric tons)

AXIS AND AXIS SATELLITES	Light Motor Fuel	Kerosene	Lubricants	Gas Oil	Fuel Oil	Total
Germany	1228	115	545	567	275	2730
Protectorate and Slovakia	46	22	28	9	5	110
Italy	115	30	60	55	225	485
Hungary	70	82	17	36	45	250
Rumania	125	300	50	120	1150	1725
Bulgaria	8	17	6	12	2	45
Finland	25	10	11	4	--	50
OCCUPIED COUNTRIES OF WESTERN AND NORTHERN EUROPE						
France	130	10	55	60	45	300
Belgium	25	1	16	31	9	82
Holland	10	8	15	20	5	58
Denmark	8	10	10	35	1	64
Norway	15	7	8	15	25	70
OCCUPIED COUNTRIES OF EASTERN AND SOUTHERN EUROPE						
Baltic States	12	8	4	4	13	41
General Government of Poland	19	16	9	5	6	55
Occupied Russia	135	60	25	45	35	300
Serbia and Croatia	8	6	6	8	7	35
Greece	6	3	4	10	7	30
TOTAL	1985	705	849	1036	1855	6430

[1] The liquid fuel equivalent of gaseous and solid substitute fuels used is presented in a separate table apperded to the part on substitute fuels.

TABLE II. CONFIDENTIAL

ESTIMATED INDUSTRIAL AND CIVILIAN CONSUMPTION OF LIQUID FUELS AND LUBRICANTS IN AXIS EUROPE, 1938

Breakdown According to Countries and Products

(Thousand metric tons)

AXIS AND AXIS SATELLITES	Light Motor Fuel [1]	Kerosene	Lubricants	Gas Oil	Fuel Oil	Total
Germany	3441	170	571	1705	1113	7000
Czechoslovakia	250	80	50	35	35	450
Italy	465	177	110	280	1758	2790
Hungary	76	72	14	30	49	241
Rumania	153	182	24	154	1409	1922
Bulgaria	18	29	8	23	8	86
Finland	136	69	17	34	2	258
OCCUPIED COUNTRIES OF WESTERN AND NORTHERN EUROPE						
France	2540	144	250	440	2417	5791
Belgium	395	22	61	123	95	696
Holland	415	255	57	496	271	1494
Denmark	310	100	31	220	115	776
Norway	180	37	33	159	158	567
OCCUPIED COUNTRIES OF EASTERN AND SOUTHERN EUROPE						
Baltic States	44	76	13	21	47	201
Poland	118	137	40	63	29	387
Occupied Russia [2]	650	2065	515	385	2345	5960
Yugoslavia	42	32	20	22	43	159
Greece	72	25	11	60	202	370
TOTAL	9305	3672	1825	4250	10096	29148

1 Includes small quantities of substitute fuels.

2 Refers to the area under German occupation as of July 1943.

TABLE XLI

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ESTIMATED INDUSTRIAL AND CIVILIAN CONSUMPTION OF LIQUID FUELS AND LUBRICANTS IN AXIS EUROPE, 1943 1/

Breakdown According to Countries and Uses

(Thousand metric tons)

AXIS AND AXIS SATELLITES	Road Transportation	Railways	Inland Shipping	Bunkers	Commercial Aviation	Agriculture	Industry	Household	Total
Germany	958	84	150	108	23	349	1000	60	2730
Protectorate and Slovakia	38	8	6	--	--	14	30	14	110
Italy	85	7	54		3	70	246	20	485
Hungary	41	6	16	--	3	73	66	45	250
Rumania	84	276	214		1	49	716	385	1725
Bulgaria	8	1	3	--	--	19	9	5	45
Finland	23	2	6		--	7	9	3	50
OCCUPIED COUNTRIES OF WESTERN AND NORTHERN EUROPE									
France	132	8	25		--	36	89	10	300
Belgium	25	3	9	--	--	3	41	1	82
Holland	11	3	22	--	--	4	11	7	58
Denmark	8	3	23		--	9	15	6	64
Norway	12	1	38		--	5	11	3	70
OCCUPIED COUNTRIES OF EASTERN AND SOUTHERN EUROPE									
Baltic States	11	11	--	--	--	5	8	6	41
General Government of Poland	16	2	--	--	--	10	15	12	55
Occupied Russia	84	16	10	--	--	95	75	20	300
Serbia and Croatia	13	--	2	--	--	2	13	5	35
Greece	6	--	9		--	7	5	3	30
TOTAL	1555	431	695		28	757	2359	605	6430

1/ The liquid fuel equivalent of gaseous and solid substitute fuels used is presented in a separate table appended to the part on substitute fuels.

TABLE IV

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ESTIMATED INDUSTRIAL AND CIVILIAN CONSUMPTION OF LIQUID FUELS AND LUBRICANTS IN AXIS EUROPE, 1938

Breakdown According to Countries and Uses

(Thousand metric tons)

AXIS AND AXIS SATELLITES	Road Transportation	Railways	Inland Shipping	Bunkers	Commercial Aviation	Agriculture	Industry	Household	Total
Germany	3624	94	137	890	31	345	1665	216	7000
Czechoslovakia	225	20	9	--	4	28	104	60	450
Italy	625	15	--	880	20	158	1026	66	2790
Hungary	58	6	11	--	3	42	76	45	241
Rumania	108	273	--	381	2	26	845	287	1922
Bulgaria	17	3	---	7	--	12	27	20	86
Finland	134	3	13	5	1	26	30	46	258
OCCUPIED COUNTRIES OF WESTERN AND NORTHERN EUROPE									
France	2524	43	127	1305	21	132	1112	527	5791
Belgium	406	9	32	56	5	21	153	14	696
Holland	420	17	108	449	15	24	236	225	1494
Denmark	292	22	118	113	2	39	93	97	776
Norway	174	3	91	175	1	16	76	31	567
OCCUPIED COUNTRIES OF EASTERN AND SOUTHERN EUROPE									
Baltic States	41	29	1	--	--	19	55	56	201
Poland	87	7	4	15	3	21	118	132	387
Occupied Russia [1]	380	760	160		--	1880	1700	1080	5960
Yugoslavia	47	5	12	--	1	6	63	25	159
Greece	55	--	48	38	1	8	184	36	370
TOTAL	9217	1309	5185		110	2803	7561	2963	29148

1. Refers to the area under German occupation as of July 1943.

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TABLE V

ESTIMATED INDUSTRIAL AND CIVILIAN CONSUMPTION OF LIQUID FUELS, LUBRICANTS AND SOLID AND GASEOUS SUBSTITUTES (IN TERMS OF THEIR LIQUID FUEL EQUIVALENTS)

IN AXIS EUROPE[1], 1943 and 1938

(Thousand metric tons)

	Light Motor Fuel		Kerosene		Lubricants		Gas Oil		Fuel Oil		Equivalent of Substitutes	Total excl. Occupied Russia			Total incl. Occupied Russia	
												Liquid	Liquid and Substitutes		Liquid and Substitutes	
	1943	1938[2]	1943	1938	1943	1938	1943	1938	1943	1938	1943	1943	1943	1938[2]	1943	1938
Road Transportation	1246	7596	---	7	90	292	135	942	---	---	1012	1471	2483	8837	2600	9217
Railways	24	35	---	--	61	86	49	138	281	290	34	415	449	549	465	1309
Inland Shipping and Bunkers	42	94	3	39	42	105	294	1162[3]	304	3625[3]	24	685	709	5025	724	5185
Commercial Aviation	27	104[4]	---	--	1	4	---	---	---	---	---	28	28	110	28	110
Agriculture	200	193	158	330	77	100	227	300	---	---	121	662	783	923	918	2803
Industry	311	622	19	70	553	723	286	1205	1115	3241	37	2284	2321	5861	2396	7561
Household	---	9	465	1161	---	---	---	118	120	595	---	585	585	1883	605	2963
Total excl. Occupied Russia	1850	8655	645	1607	824	1310	991	3865	1820	7751	1228	6130	7358	23188	----	----
Total incl. Occupied Russia	1985	9305	705	3672	849	1825	1036	4250	1855	10096	1306	----	----	----	7736	29148

1 Excluding Occupied Russia.
2 Including minor quantities of substitute fuels.
3 Of which bunker requirements accounted for 682,000 tons of gas oil and 3,546,000 tons of fuel oil.
4 Aviation gasoline.

I. INDUSTRIAL AND CIVILIAN CONSUMPTION OF LIQUID PETROLEUM PRODUCTS IN GERMANY DURING 1943

(See Tables 1 and 2)

Overall Consumption

Whereas up to 1942 liquid fuel consumption in Germany was at a higher level (compared with peace-time requirements) than in any Axis countries except Hungary and Rumania, the dire emergency in 1943 compelled the Nazis to slash sharply their allocations of petroleum for domestic civilian usages. The basic allowance of motor fuel and Diesel oil for dealers and large consumers was reduced as of March 1943 from 75 percent to 50 percent of the 1941 level (Oel und Kohle, 18 March 1943).

The actual decline in 1943 was, therefore, of the order of one-third of 1942 requirements.

Road Transportation

In September 1942 when Schell was replaced by General Kuhn, road transport was organized under the "Amtsgruppe Motorisierung" of the Ministry of Armaments (British Enemy Oil Intelligence Committee, 22 February 1943). This reorganization was undertaken to cope with the problems created by the strained motor fuel position of the Reich. A smaller number of vehicles with lower fuel rations per unit had to maintain transportation at practically the same volume as in 1942. In spite of all efforts of reorganization and substitution, however, a slowing up in the whole economy could not be avoided.

Lubricating oil requirements are calculated throughout as 3 percent (by weight) of the motor fuel consumption of road vehicles.

Motorcycles

The number of motorcycles in use in July 1943 has tentatively

been put at 650,000, or about 15 percent below the 1942 figure. No motorcycles for civilian use have been produced for over 4 years, and the rate of depreciation must be increasing rapidly. Because of the scarcity of liquid fuel supplies, unit consumption per motorcycle has been put at .1 tons a year, or slightly below the 1942 allocation.

Private Cars and Taxis

The total number of private cars and taxis in use in July 1943 has been put at 200,000 as compared with 225,000 in 1942. The number of vehicles available for official use (government, police, and Party), emergency services (hospitals, fire services, ARP), doctors, and taxi services was very small. In most towns, for instance, taxis could only be obtained for specific emergency uses. Doctors, who had previously been permitted to use petrol-driven cars, were no longer able to run them (Hamburger Fremdenblatt, 29 January 1943, and British Enemy Oil Intelligence Committee, 15 February 1943).

In June 1943 most private cars were still using liquid fuel. The restrictions which had been imposed on the use of liquid gas prevented any large increase in the use of this fuel between June 1942 and June 1943 (Oel und Kohle, 1 October 1943). Conversion to gaseous and solid substitute fuels did not start on a large scale until late in 1943 (see part on Substitutes). It has been assumed that of the total number of cars, 175,000 use petroleum, 15,000 liquid gas, and 10,000 gaseous and solid substitute fuels.

The unit consumption per car has been put at .6 tons per year. The use of a relatively low figure for the unit requirements in the case of all liquid fuel using vehicles is justified, because the fuel shortage prevented full utilization of these vehicles. This fact is

frequently mentioned in the German Press. Moreover, there is no assurance that fuel rations for vehicles employed in essential war work will always be honored.

Busses

The number of busses in use in July 1943 has been put at 11,000 as against 12,000 in 1942. By July 1943 probably 5,000 busses (3,000 of them Diesel engined) were converted to liquid gas (see Deutsche Bergwerks Zeitung, 31 July 1943), 1,000 to city gas, and 2,000 to solid fuels. About 3,000 were still using liquid fuel, 1,000 of them probably gasoline and 2,000 Diesel oil. The unit consumption has again been put at 12 tons a year for gasoline engined busses and 10 tons for Diesel vehicles.

Trucks

There is considerable incidental intelligence indicating that the number of civilian trucks in use in 1943 was considerably lower than the pre-war figure and also below that for 1942. The total number of trucks in use as of June 1943 has been put at 320,000 units compared with 350,000 units in 1942. This figure does not include some 25,000 vehicles driven by electric motors. Of this total, 105,000 were generator trucks, 12,000 used gaseous fuels (see part on Substitutes), 80,000 were driven by liquid gas, 10,000 by Diesel oil, and 113,000 by light motor fuel (see below).

The decline in the total number of trucks in use was caused by the shortage of liquid fuels, by the increasing rate of depreciation, by the effects of the tire shortage, and by the enormous military requirements for trucks (according to Russian communiqués, some 200,000 were lost at Stalingrad and in the summer retreat at the Russian Front).

Because of the large number of less efficient substitute fuelled trucks included in this total (117,000 vehicles), the actual decline in the efficiency of road transportation was even greater than indicated by the above figures. If all the 320,000 trucks were fully utilized their efficiency would correspond to that of 280,000 liquid fuelled trucks. Though fuel allocations per truck in 1943 were probably at a level of only two-thirds of the peace time volume, the ton-mileage per truck was probably not much below the pre-war figure, as the better utilization of loading space on each trip (including return journeys) compensated for reduced mileage.

Comparison with British Estimates

The estimate suggested here for the number of trucks in use is well below the British figure of 420,000. The high British estimate of the total number of trucks is predicated on their estimate of the number of substitute fuelled trucks, which exceeds the corresponding American figure by some 140,000 units. If the British estimate of the total number of trucks had not been as high as it is there would have been little or no allowance for trucks running on liquid motor fuels. Intelligence indicated, however, that most of the smaller trucks still used liquid motor fuel.

On the other hand, intelligence on the number of substitute fuelled trucks (some 117,000 as shown in Part II) is, in our opinion, convincing. The figure for liquid gas using trucks of some 80,000 is also well documented and is accepted by the British.

If, however, we accepted the British estimate of the total number of trucks and the American estimate of the number of trucks using substitute fuels, the total number of trucks still using liquid fuels would amount to 210,000. This again would contradict in-

telligence which indicates that the conversion program for medium and large trucks is practically completed.

Actually, the British estimate of the total number of trucks takes insufficient account of the fact that immediately after the outbreak of war a large number of trucks were requisitioned by the German army. During the first two years of war new production and requisitioning from occupied countries compensated for only half of this loss (see Essener National Zeitung, 14 January 1942, and an article by Schell in Die Strasse, Number 23, 1940). Since the Russian campaign allocations of trucks for civilian uses in Germany has, of course, been even smaller than before. The huge military requirements, together with the needs in Occupied Russia, have absorbed Europe's production capacity and its pool of trucks. As far as it can be ascertained, most of the trucks requisitioned in occupied countries have been taken over by the German army and no large scale transfer to civilian uses in Germany seems to have taken place.

Additional incidental intelligence indicates that the number of trucks available in 1943 was well below the pre-war level and also below that of 1942. The following items are presented herewith:

1. The number of driver's licenses suspended in 1942 was 33 percent below the 1941 figure and 66 percent below that of 1940 (Das Reich, February 1943).

2. The local distribution of fuel, building materials, groceries, newspapers, etc., by motor vehicles has been reduced to a minimum. For instance, Das Reich in an article of 29 November 1942, stated that, whereas formerly every second grocer in Berlin owned a truck, now only those with more than 1,500 customers could obtain motor fuel. In

December 1942 it was reported that petrol rations were no longer issued for the distribution of vegetables (British Enemy Oil Intelligence Committee, 26 June 1943). A large part of the local distribution of daily necessities is done by street cars (Deutsche Allgemeine Zeitung, 1 April 1943).

3. Long distance road traffic has been cut to a fraction of its former level (Deutsche Bergwerks Zeitung, 13 December 1942). The decline in long distance road transportation is also shown by the fact that, as of 15 May 1943 all maintenance work on the Reichsautobahnen was stopped and that most of the filling stations were closed (Deutsche Nachrichten Buero, 9 June 1943).

4. Police, ARP, and army vehicles have often been used to cover the most urgent industrial road transportation requirements (Deutsche Allgemeine Zeitung, 1 January 1943).

Diesel Trucks

It is very likely that a large part of the civilian trucks which were requisitioned by the army consisted of medium and heavy trucks. Most of the heavy trucks were undoubtedly Diesel engined, for Diesel trucks were predominant among Germany's heavy vehicles. They were largely used in long distance road transportation, which was cut down severly immediately after the outbreak of war (see article in Vierjahresplan of October 1940 which states that the Diesel truck was the mainstay during the Polish and French campaigns). It is likely, therefore, that the number of civilian medium and heavy trucks has been reduced considerably, and that, in particular, the number of heavy Diesel trucks left for industrial uses is very small.

In the 1942 OSS study their number was put at 25,000 compared with a figure of 94,000 in the British estimates. The total number of Diesel trucks and busses in 1939, however, was only 70,000 (see also Petroleum Press Service, 1943, p. 147). The 1942 OSS estimate has been left unchanged in the present study. It is assumed that 15-16,000 have been converted to substitute fuels and that the rest still use Diesel oil.

In support of the low estimate for the total number of Diesel trucks still in civilian use, it may be mentioned that Schell in his speech of September 1941 stated that only 16,000 civilian Diesel vehicles were suitable for conversion. If the total number of civilian Diesel vehicles in use in 1942 had been as high as was estimated by the British and if Schell's statement is accepted, then 78,000 Diesel vehicles would still use Diesel oil. This would mean that more than half of the 113,000 trucks still running on liquid fuel are medium or heavy Diesel trucks. Intelligence, however, indicates that most of the trucks still using liquid fuel are small trucks, delivery vans, and converted private cars. According to a decree issued in September 1943 the conversion of most gasoline trucks of 3 tons and over, and of most Diesel trucks of 2 tons and over, has virtually been completed, and only smaller trucks and private cars still run on liquid fuel (see part on Substitutes).

Unit Fuel Requirements of Liquid Fuelled Trucks

Liquid fuelled trucks, according to all indications, have not been utilized fully. The German Press has mentioned again and again that conversion to substitute fuels would allow a higher mileage per vehicle. It has therefore been assumed that the annual unit consumption of the remaining small and not fully utilized gasoline trucks in 1943 was 3.0 tons and that of Diesel trucks 3.5 tons.

Since May 1943 SDK I (Sonderdieselkraftstoff I), a mixture of gasoline and gas oil in the ratio of 2 to 1, has been used wherever fire risk did not prevent its employment (Koelnische Zeitung, 21 March 1943). It has been assumed that for the whole of 1943, one-quarter of the Diesel oil requirements have been replaced by gasoline. Similar assumptions will be made for the use of Diesel oil in inland shipping, agriculture, and industry.

Liquid Gas

Liquid gas (propane and butane) is a by-product of the synthetic oil industry. It is called liquid gas because the gas liquefies under very low pressure. It is usually distributed in steel bottles holding 78 liters or some 33 kilograms of liquid gas (1,315 millimeters long and 317 millimeters in diameter). (Formerly a larger bottle holding 108 liters or 46 kilograms of liquid gas was used.) The weight of the bottle itself is 40 kilograms. The gasoline equivalent of the liquid gas contained in one bottle is about 56 liters.

The distribution of this fuel is monopolized by the A.G. der Kohlenwertstoffverbaende, the Benzin-Benzol Verband, and I.G. Farben. Motor vehicles using this fuel usually carry at least two bottles while busses carry from three to five bottles. Trucks used in long distance transportation carry up to ten bottles (Oel und Kohle, 15 July 1943). A small number of vehicles have been equipped with steel containers holding about 300 liters of liquid gas each. These vehicles can refill very rapidly, but they can only be used where special filling stations are available. The exchange of an empty bottle for a full one takes about ten minutes.

With the expansion of the synthetic oil industry increasing quantities of liquid gas have been produced, but competing vital uses (rubber, aviation gasoline, and probably other secret war uses) have limited the amount of liquid gas which could be allocated for use as motor fuel. Road vehicles converted to liquid gas numbered 85,000 in May 1942 (Essener National Zeitung, 10 May 1942) as against 80,000 in April 1942 and 33,000 in September 1939 (Berliner Boersen Zeitung, April 1942). The rate of conversion since the autumn of 1942 has slowed up considerably (see Oel und Kohle, 15 July 1943). In the autumn of 1942 it was actually decreed that trucks of 3 tons and over using liquid gas should be converted to the use of solid fuels (British Enemy Oil Intelligence Committee, 4 January 1943). There is, however, reason to believe that no large scale re-conversion to substitute fuel actually took place though new conversions to liquid gas were delayed. For example, Oel und Kohle, 1 October 1943, stated that permission may still be granted to convert automobiles used by doctors and for other vital services to liquid gas. The rate of conversion, so it was stated, was limited by the availability of equipment and of fuel. A recent cable from Bern (November 1943) states that liquid gas is "Germany's third fuel", after natural or synthetic motor fuel and after benzol. This cable would indicate that the present consumption of liquid gas as a motor fuel is below 500,000 tons (the estimated output of motor benzol), though production is much larger.

The total number of liquid gas using vehicles in June 1943 has been put at 100,000 -- assuming, in other words, practically no new conversions since the middle of last year. Of the 100,000 vehicles using liquid gas, an estimated 15,000 are private cars, 5,000 busses,

and about 80,000 trucks. Only a small number of these trucks, probably not more than 5,000, were formerly Diesel engined, since the conversion of Diesel vehicles to liquid gas presents great technical difficulties (Oel und Kohle, 15 July 1943). Not until April 1943 was it reported that it was technically possible to convert the largest part of the Diesel busses to liquid gas (Verein deutscher Ingenieure, 3 April 1943 and 24 July 1942).

Because liquid gas was rationed and because it was mostly used by trucks with up to 3 tons carrying capacity, there is no reason to assume that the unit consumption of liquid gas using vehicles was different from that of liquid fuelled vehicles. For the first 5 months of 1942 liquid gas was not rationed and a higher unit figure was used for that year.

Petroleum Products Needed for Generator Vehicles

Certain types of generators and certain kinds of operation (quick starting, up-hill climbing, etc.) require the use of some liquid motor fuel. Rations for these purposes will only be granted against a certificate of necessity issued by the Engineer of the Central Office for Mineral Oils (Muenchener Neueste Nachrichten, 1 May 1943). It has been assumed that on an overall basis 5 percent of the solid fuel requirements of generator vehicles (expressed in terms of liquid fuel) must be supplied as liquid motor fuel. Converted Diesel vehicles, however, consume about 30 percent as much Diesel oil after conversion as before. Finally, the lubricating oil requirements of generator vehicles and gas using vehicles can be put at 5 percent and 3 percent, respectively, of their fuel consumption (in terms of liquid fuel).

Railways

Estimates of the oil requirements of the German railways in 1943 have not been changed materially as compared with those presented in the 1942 OSS study. Some minor changes have been introduced to account for the development in the use of substitute fuels during the last year. In spite of the loss of vast Russian territories, the conquest of which had been mainly responsible for increasing the German rail network from 54,000 kilometers in 1939 to 150,000 kilometers in 1942, the number of locomotive kilometers in 1943 was not materially different from 1942. In the first half of 1943 there was even an increase over the corresponding period in 1942 (Bern Cable, 16 November 1943).

Inland Shipping and Fishing

The 1943 estimates are based on the OSS estimates for 1942. According to the Deutsche Volkswirt, quoted by the Ministry of Economic Warfare Weekly, 18 February 1943, inland waterways carried 20 percent more traffic in 1942 than in 1941, and 20 percent more in 1941 than in 1940 (Berliner Boersen Zeitung, 10 June 1942). Between 1940 and 1942 the tonnage carried by inland shipping would thus have risen from 125 million tons to 180 million tons. In 1943 every effort was made to increase the tonnage even further. This could only be achieved, however, by more efficient organization and better utilization of shipping space. Intelligence reports indicate that motor fuel allocations to inland shipping have been cut at least locally and temporarily (Bern Cable, 29 June 1943 and British Enemy Oil Intelligence Committee, 19 July 1943 and 9 August 1943). In some cases motor barges have been used as dumb barges in tow of steam tugs. The program of converting ships to generator propulsion has made only slight progress. On the whole, allocations

of liquid fuel to inland shipping are probably somewhat below the 1942 level. Since May 1943, Sonderdieselkraftstoff I (a mixture of gasoline and Diesel oil in the ratio of 2 to 1) and a mixture of synthetic gasoline (59 percent) and Rumanian gas oil (41 percent) has been used in many motor barges (Koelnische Zeitung, 21 March 1943, and British Enemy Oil Intelligence Committee, 24 May 1943). It has been assumed that over the year requirements have been 20 percent below 1942 and that one-quarter of the Diesel oil requirements have been replaced by motor fuel.

Oil requirements for Rumanian and international shipping on the Danube have been included with Rumanian consumption figures, since it is likely that the bulk of these requirements has been satisfied by bunkering in Rumania (see part on Rumania).

Bunkers

No exact information is available on Axis shipping tonnage used in 1943 in Northern Waters and in the Atlantic Ocean, nor on the average percentage of oil burning and Diesel engined ships in this total. According to estimates supplied by the Foreign Economic Administration, probably not less than 2 million gr. t. were actually in use in 1943, or about the same figure as in 1942. Shipping along the European coast from Emden to Reval, in the Baltic, along the Norwegian coast, and along the French Atlantic coast was heavy throughout the year (Deutsche Volkswirtschaft, October 1943). As of December 1942, 72 percent of all shipping was operated on coal, 21 percent on Diesel oil, and 7 percent on fuel oil. These figures correspond closely to the 1942 OSS estimates.

The percentage of oil burning ships in the total declined during 1943. Intelligence indicates that oil using ships have been

replaced wherever possible by coal burning steamers. There are reports that even in cases of a local or temporary shortage of steamers, available motor ships have not been used. In very few cases have Diesel ships been converted to coal. The use of oil in shipping could not be eliminated altogether, however, since insufficient coal burning tonnage was available to meet all needs for tankers and certain other types of vessels. Intense use has also been made of sailing vessels with auxiliary motors, especially in the trade with Denmark.

On the whole, it has been assumed that Diesel and fuel oil requirements for shipping in 1943 have fallen to half of the 1942 consumption. Lubricating oil requirements, including those for coal burning steamers, have been left unchanged.

Commercial Aviation

It is suggested that the 1942 estimates for aviation gasoline be increased to 20,000 tons to include the requirements for air connections between Germany and occupied countries. As far as can be ascertained, the establishment of commercial air transportation between European cities made further slight progress during 1943.

Agriculture

The number of tractors in the 1942 report was given as 120,000, a figure based on German press reports (Deutsche Volkswirtschaft, February 1942). By the middle of 1943 the number probably increased to some 130,000 units. The estimated increase in 1943 is much smaller than that experienced in the preceding year, since a large part of the new production of tractors was probably needed in Occupied Russia, where only a small number of repairable tractors was left behind by the Russians.

The stringency of oil supplies prevented the farmers from

using their tractors with the same degree of intensity as before (see speech by the German Secretary of Agriculture, Backe, quoted in the Koelnische Zeitung, 13 November 1942, and British Enemy Oil Intelligence Committee, 11 January 1943). The use of tractors for other purposes than cultivation and harvesting, such as for general road haulage and as a source of stationary power, was prohibited in January 1943 (Wochenblatt der Landesbauernschaft Rheinland, 2 February 1943, and Neues Wiener Tagblatt, 6 February 1943). Estimated unit requirements per tractor have therefore been reduced by about 20 per cent. This conforms with a statement in Oel und Kohle, May 1943, according to which allocations of mineral oils to agriculture were cut by about 20 percent on 27 March 1943.

Estimates for the requirements of other agricultural machines have also been reduced by 20 percent. The program of converting these machines to other sources of power has probably not yet made satisfactory progress (see Verein deutscher Ingenieure, 6 March 1943). Moreover, 850,000 farms do not have electric power connections and depend largely on oil engines (Neues Wiener Tagblatt, 3 December 1942).

As Sonderdieselkraftstoff I has been widely used since May 1943, one quarter of the Diesel oil requirements have probably been supplied in the form of gasoline. Reports also indicate that to some extent gasoline has been used instead of power kerosene (British Enemy Oil Intelligence Committee, 22 February 1943). It is assumed that one-sixth of the 1943 agricultural kerosene supplies actually consisted of gasoline. Finally, a small allowance has also been made for the liquid fuel requirements of converted gasoline and Diesel tractors.

Agricultural lubricating oil requirements have been left at the 1942 level. Increased consumption of substitute driven engines has

probably more than absorbed the savings resulting from the reduced utilization of oil driven units.

Industry

Estimates for the requirements of technical gasoline and gas oil in 1943 have been reduced 10 percent below the 1942 level. A similar change is suggested for the estimated requirements of light motor fuel in movable and stationary industrial equipment. A considerable part of the demand was and probably still is supplied in the form of liquid gas.

Industrial Diesel oil requirements have been left at the 1942 level. It is assumed that, in spite of all efforts to save oil, the air raids compelled public utilities and other plants to use their stand-by Diesel engines. The cleaning up of cities, etc., has also necessitated increased use of heavy building equipment. It is again estimated that, as Sonderdieselkraftstoff I is being used wherever possible, one quarter of the Diesel oil requirements have been replaced by gasoline.

The estimated aviation gasoline and motor fuel (liquid gas) requirements for the preliminary running in of engines at the factories have been reduced somewhat. It is known that fuel rations for this purpose have been cut and that substitute fuels, especially city gas, are used wherever possible (Oel und Kohle, 8 March 1943). Aviation gasoline requirements for the testing of airplane engines and for test flights have been included with military consumption.

The industrial use of fuel oil has been put at 50 percent of the 1938 figure, or slightly below the 1942 estimate.

In October 1942 new stringent regulations were imposed on the use of lubricating oils and greases. Lubricants may be used only

for war vital uses and allocations have to be calculated in such a way as to enforce the greatest possible economy (Deutsche Volkswirt, 25 September 1942). Consumers who used up to 600 kilograms in 1941 could obtain the same quantity in 1942 (and presumably in 1943). However, consumers who used more than 600 kilograms in 1941 could obtain in 1942 only 600 kilograms plus 50 percent of the excess quantity required over and above 600 kilograms. Intelligence also indicates that the greatest efforts have been made to economize in the use of processing oils (Oel und Kohle, 1 October 1942, 1 November 1943, and Petrolem Times, July 1943). On the other hand, since January 1943 50 percent new lubricants have been given without ration cards for old lubricants delivered to reclaiming plants. Up to that time only 40 percent new oil had been given in exchange, and for half the quantity (20 percent) ration cards had to be given up (Hamburger Fremdenblatt, 26 January 1943).

Weighing all these factors, it has been estimated that industrial consumption of lubricating oil has been reduced to 400,000 tons in 1943, a saving of 5-10 percent compared with 1942.

Household

Kerosene rations for lighting and cooking for households without gas or electricity have been kept at the 1942 level (British Enemy Oil Intelligence Committee, 2 May 1943). The air raids on Germany led in many cases to an interruption of utility services and compelled the Central Office for Mineral Oils to raise its allocations of kerosene for essential cooking and lighting (e.g., in Munich kerosene was distributed after the air raids of March 1943, Muenchener Neueste Nachrichten, 13 March 1943). The 1942 estimates for household requirements of kerosene have therefore been raised to 60,000 tons.

II. INDUSTRIAL AND CIVILIAN CONSUMPTION OF LIQUID PETROLEUM PRODUCTS IN THE PROTECTORATE AND SLOVAKIA DURING 1943

(See Tables 3 and 4)

Overall Consumption

The petroleum requirements of the Protectorate and Slovakia have been estimated by reducing the pre-war consumption of these two areas by the same percentage as that applicable to Germany. As the pre-war consumption of the Protectorate and Slovakia amounted to some 300,000 tons out of a total of 450,000 tons for the whole of Czechoslovakia, the 1943 consumption of these 2 areas has been estimated at 110,000 tons. Of this total it is estimated that 46,000 tons are light motor fuel, 22,000 tons kerosene, 28,000 tons lubricants, 9,000 tons gas oil, and 5,000 tons fuel oil. Though this method of estimation is the same as used by the British Ministry of Economic Warfare, our consumption figures for 1943 are below the British ones. The MEW applied its percentage reduction to the total pre-war consumption of Czechoslovakia, including the Sudeten territory and the parts ceded to Hungary and Poland. The consumption for the latter 3 areas, however, was already included with the estimates for Germany and Hungary, since the intelligence upon which the estimates are based refers to the present boundaries of these countries.

Of the total requirements of 110,000 tons some 80,000 tons have been arbitrarily allocated to the Protectorate and 30,000 to Slovakia. Statistics for Slovakia indicate that 42,000 tons of oil products were imported from Rumania in 1942 (Neues Wiener Tagblatt, 5 December 1942) and 47,000 tons in the first nine months of 1943. Together with domestic production supplies would thus have amounted to some 70,000 tons. However, refined products were exported from Slovakia to Denmark, Finland, Sweden, and Germany (Neues Wiener Tagblatt,

14 April 1943), and part of the oil supplies available in Slovakia were used by the Slovakian army.

PROTECTORATE

Organization of Distribution

Petroleum rations in the Protectorate were severely curtailed during 1943. As of July 1943 a new administrative control, similar to that in Germany, was established by giving a monopoly of all sales to the Mineraloelvertriebs G.m.b.H. (Der Neue Tag, 23 June 1943).

Road Transportation

The use of liquid fuelled road vehicles was put under additional restrictions in 1943. It has been reported that motor transport may only be used for war vital uses (Oel und Kohle, 1 October 1943). Bus services have also been reduced (British Enemy Oil Intelligence Committee, 1 March 1943). Most heavy trucks use either producer gas or liquid gas (British Enemy Oil Intelligence Committee, 1 March 1943).

Agriculture

On the basis of the petroleum allocations to agriculture during the first 3 months of 1943, it appears that consumption in 1943 has been reduced by 20 percent.

Industry

Allocations during the first quarter of 1943 also seem to indicate a decline in rations by 20 percent. Severe restrictions on the use of lubricants and greases were imposed early in the year (Der Neue Tag, 16 February 1943).

Household

Since January 1943, special requisition cards have been ndeded to obtain kerosene (Der Neue Tag, 13 December 1942). Relatively liberal rations for lighting, heating, and cooking purposes have been granted for apartments and houses without gas or electricity as shown in the

following table: (Der Neue Tag, 17 June 1943 and 23 September 1943).

KEROSENE RATIONS DURING THE FOURTH QUARTER OF 1943

(in liters)

	October	November	December
Lighting	1	2	2
Lighting plus additional rations	2	3	3
Lighting plus increased additional rations	4	5	5
Cooking	6	6	6
Heating	7	10	10

SLOVAKIA

Road Transportation

New restrictions on motor transportation, because of the shortage of motor fuel and tires, were imposed in September 1943 (Deutsche Bergwerks Zeitung, 20 August 1943). Motor vehicles may only be used for war vital purposes. Rations are issued only by the Supreme Board of Supply (Oel und Kohle, 1 October 1943 and Slovakian, 5 September 1943). Some increased supplies (as compared with 1939) have been needed for bus services. The number of bus lines has increased from 26 to 41, and the length of the lines from 819 kilometers to 2,140 kilometers (Deutsche Bergwerks Zeitung, 12 March 1943).

Agriculture

Very small rations were granted to agriculture in 1943. The size of the rations depended on the areas under grain (Gardista, 1 August 1943).

Household

A severe shortage of kerosene was reported during 1943. Gasoline was frequently used for lighting purposes (British Enemy Oil Intelligence Committee, 18 January 1943). The size of the rations, however, remained unchanged (Slovakian, 5 September 1943).

III. INDUSTRIAL AND CIVILIAN CONSUMPTION OF LIQUID PETROLEUM PRODUCTS IN ITALY DURING 1943

(See Tables 5 and 6)

Overall Consumption

Italy's total available petroleum supplies in 1943 have been estimated at less than 1.2 million tons. This estimate is based on imports from Rumania, Hungary, Albania, and Germany, and on domestic supplies of crude oil, alcohol, benzol, tar oils, and vegetable oils. This figure does not include supplies for the German armed forces, which reportedly maintained their own supply and distribution system (see Bern Cable, 14 May 1943). Deducting Italian army, naval, and air force requirements during the first 8 months of 1943 of some 700,000 tons, less than 500,000 tons remained for Italian civilian requirements. These quantities had to cover the demand of Italy, Sicily and Sardinia up to July 1943, of Italy without Sicily and Sardinia between July and September, and of about two-thirds of the Italian mainland for the rest of the year.

The product breakdown has in part been established on the basis of a use pattern. It is estimated that of the total requirements of 485,000 tons, 115,000 tons were light motor fuel, 30,000 tons kerosene (the large percentage of gasoline which was mixed with kerosene is included with gasoline), 60,000 tons lubricants, 55,000 tons gas oil and 225,000 tons fuel oil.

Road Transportation

Italian gasoline rations were cut several times during 1941 but remained, as far as it is known, practically unchanged during 1942 and 1943. Monthly motor fuel rations in Italy toward the middle of 1943 were reported as follows:

MONTHLY MOTOR FUEL RATIONS IN ITALY

(in liters)

	Motor fuel ration
Motorcycles	5
Private cars and motor boats	20
Taxis	50-100

Lubricants were rationed as follows:

1½ kilogram per 100 liters of gasoline

3 kilograms per 100 liters of gas oil

1 kilogram per 100 cubic meters of methane

750 grams per 100 liters of charcoal

500 grams per 100 kilograms of wood.

Busses used in public road service received about 25 percent more lubricants per unit of fuel.

The size of supplementary rations and the number of licensed vehicles have, however, been continuously reduced. All vehicle licenses issued before April 1943 were cancelled on 5 April 1943. New licenses were to be issued by the Commissariat for Liquid Fuel. Vehicles could only be used locally in the provinces where they were registered and only on week days during the daytime (British Enemy Oil Intelligence Committee, 31 May 1943). The number of licenses was to be reduced by 20 percent. Bus services have also been cut (Bern Cable, 3 August 1943).

Railways and Shipping

It is suggested that the 1942 estimates for railway requirements be used for 1943.

Bunker, coastal shipping, and fishing requirements, estimated at 160,000 tons in 1942, have fallen considerably in 1943. The serviceable

cargo tonnage in the Mediterranean declined from about 1.6 million gr. t. in 1942 to about .5 million tons in September 1943 and to only .25 million tons in October. This decline must have led to a sizeable reduction in bunker oil requirements. However, it must also be borne in mind that every serviceable ship was probably used, regardless of whether it used oil or coal. As the average serviceable tonnage in 1943 was about one-third of that in 1942, our estimates for Italian bunker oil requirements in 1943 have been put at one-third of the 1942 level.

Agriculture

Oil supplies to agriculture, estimated at 84,000 tons in 1942 (compared with pre-war requirements of 130,000 tons), were probably cut to 70,000 tons.

Industry and Household

Industrial fuel oil consumption has been estimated at some 200,000 tons. Estimates for household consumption of kerosene have been reduced to about 20,000 tons in 1943. At the present level, kerosene rations are insufficient to cover essential cooking needs (British Enemy Oil Intelligence Committee, 2 May 1943).

IV. INDUSTRIAL AND CIVILIAN CONSUMPTION OF LIQUID PETROLEUM PRODUCTS IN ALBANIA DURING 1943

Overall Consumption

Albanian oil requirements have heretofore been included with the estimates for Italy. In view of the Allied armistice with Italy, however, there is now no reason to combine these two estimates.

Total Albanian consumption, which is of the order of 10,000 tons, can be covered from Albanian production (some 130,000 tons a year), which at present has no outlet either to Italy or to Axis Europe. It has been assumed that the local topping plant can refine Albania's total requirements. As Albanian production is no longer included with the sources of crude oil supplies available to the Axis, Albanian requirements should also not be included with Axis consumption statistics.

V. INDUSTRIAL AND CIVILIAN CONSUMPTION OF LIQUID PETROLEUM PRODUCTS IN HUNGARY DURING 1943

(See Tables 7 and 8)

Overall Consumption

Compared with pre-war requirements, Hungary's present oil consumption has been maintained at a very high level. Obviously Germany has so far been unable to exert sufficient pressure either to increase Hungary's crude oil production to its possible maximum or to reduce her domestic consumption to a level comparable to the rest of Axis Europe. However, considering the fact that Hungary has acquired large new territories and has made rapid progress in the mechanization of agriculture, an estimated annual consumption of 250,000 tons in 1943 actually does represent a decline from the pre-war level of demand. It is estimated that about 70,000 tons consisted of light motor fuels (including 8,000 tons of bottled gas, see Donauzeitung, 28 July 1943), 82,000 tons of kerosene, 17,000 tons of lubricants, 36,000 tons of gas oil, and 45,000 tons of fuel oil.

Road Transportation

Motor fuel rations were cut in March and April 1943 but were raised again in May 1943. The scale of rationing, as established by decrees published between February 1942 and May 1943, is shown in the following table:

MOTOR FUEL RATIONING IN HUNGARY

(liters per month)

	As of May 1943	From 5 March 1943 to 30 April 1943	From 12 February 1942 to 4 March 1943
Motorcycles	5	2.5-5	5-10
Private cars	10-20	7.5-12.5	15-25
Trucks & Tractors	20-60	20-60	40-120

Though rations were increased on 1 May 1943 they remained in most cases below those of 1942. Further restrictions on road transportation were imposed in October 1943 (British Enemy Oil Intelligence Committee, 8 November 1943). Consumption for road transportation in 1943 has therefore been reduced by 10 percent as compared with 1942.

Railways

Locomotive kilometers in 1942 increased over 1941 by about 14 percent. During 1943 some further increase probably took place. Because of stricter economy lubricating oil consumed by the railroads was probably unchanged.

Inland Shipping

River shipping, especially on the Danube, plays a very important role in Hungarian transportation and in the transit traffic between Germany and the Balkans. Oil requirements for the latter traffic are, however, included with the Rumanian estimates. It is interesting to note that the number of ships arriving in Budapest declined from 22,263 in 1941 to 18,389 in 1942 (Pester Lloyd, 1 May 1943). This reduction was probably due to restrictions imposed on the use of motorboats. Unfavorable water conditions on the Danube also interfered with shipping.

Agriculture

On 27 March 1943 it was decreed that agricultural consumption should be curtailed to 80 percent of the 1942 level (Oel und Kohle, 1 May 1943). The order was revoked in April (Pester Lloyd, 29 April 1943). A large expansion in the use of agricultural machines is responsible for a sustained high level of agricultural consumption. The number of tractors increased, e.g., from 227 to 694 between 1939 and 1941 (Petroleum Times, 17 April 1943 and 26 June 1943). Estimates for agricultural

consumption in 1943 were increased some 10 percent over the 1942 level.

Industry and Household

According to the Hungarian Economic Yearbook for 1942, the horsepower used in Hungarian industry increased from 1.7 million to 2.2 million in 1941. However, it must be assumed that the use of oil in industry has been curtailed and is now somewhat below the pre-war level.

Kerosene rations for lighting purposes were cut in March 1943 from 85 percent to 50 percent of the 1942 rate of consumption (Pester Lloyd, 21 March 1943). They were most likely restored to their old level in May 1943.

VI. INDUSTRIAL AND CIVILIAN CONSUMPTION OF LIQUID PETROLEUM PRODUCTS IN RUMANIA DURING 1943

(See Tables 9 and 10)

Overall Consumption

The last available official statistics for Rumanian consumption refer to the period January to April 1942 and were quoted in the 1942 OSS report on civilian consumption. While consumption of liquid oil products during the 3 year period 1939-41 was slowly declining from 1,871,000 tons to 1,770,000 tons, requirements during the first 4 months of 1942 were running at the rate of 2,200,000 tons per year. This increase in 1942 was caused by extra ordinary conditions. A severe shortage of solid fuels led to increased sales of kerosene and fuel oil for heating purposes. In 1943 the downward trend of consumption was most likely resumed (see Bern Cable, 8 October 1942).

In contrast to the figures quoted above, the MEW data for the years 1939-41 indicate an upward trend of demand. However, the MEW figure for 1939 probably does not include the bunker oil requirements of Rumanian ships, which up to that year had been included with Rumanian exports and were not counted as domestic consumption. Since 1939 however, bunker demand of Rumanian ships is included with the domestic consumption statistics and the MEW figures for 1940 and 1941 accordingly include bunkers.

Further qualifications with regard to the numerous intelligence items on consumption have to be made. During the war years the statistics probably include the requirements of Bessarabia and the other Russian areas occupied by Rumania. The consumption of the Rumanian military forces in Rumania (and perhaps even part of that of

the Rumanian army in Russia) -- a total of probably 120,000 tons -- may also have been included with the consumption figures.

Considering all these facts and taking account of the serious efforts made by Rumania during 1943 to reduce its oil consumption, industrial and civilian requirements for the year have been put at 1,725,000 tons (see British Enemy Oil Intelligence Committee, 19 April 1943). It is estimated that the consumption of light motor fuel amounted to 125,000 tons, kerosene to 300,000 tons, lubricants to 30,000 tons, Diesel oil to 120,000 tons, and fuel oil to 1,150,000 tons.

Road Transportation

Petrol rationing was introduced in November 1942. The police were charged with issuing ration books (Nachrichten fuer den Aussenhandel, 27 October 1942). Rations were, however, very high as shown in the following table:

RUMANIAN MOTOR FUEL RATIONS AS OF NOVEMBER 1942

(liters per month)

	Motor Fuel
Motorcycles	30
Taxis[1]	150-650
Private cars[2]	50-300
Trucks up to 2.5 tons	600-1000
Trucks over 2.5 tons	800-1300
Agricultural tractors[3]	60
Busses and tank trucks	30 per 100 kilometers

1 According to size and location.
2 According to horsepower and use.
3 From March to December.

Beginning in March 1943 ration cards were supplied only with the permission of the Ministry of National Defense (Istanbul Cable, 18 May 1943 and British Enemy Oil Intelligence Committee, 19 April 1943), but it is not known whether the rations were changed in 1943. It is reported, however, that lack of tires and spare parts reduced motor traffic.

Railways

There are occasional reports on the conversion of Rumanian locomotives from oil to coal. Fuel oil requirements amounted to 143,000 tons in the period April to September 1942, compared with 170,000 tons during April to September 1941 and 145,000 tons during the same months of 1940 (Official Railway Statistics). In 1943 the trend was probably slightly downwards. It was reported that Germany had supplied some 60,000 tons of coal for Rumanian railways. Total railway requirements for 1943 have been estimated at 270,000 tons of fuel oil, 2,000 tons of gas oil, and 4,000 tons of lubricants.

Shipping

Not much information is available on the oil requirements for Danubian shipping. At the end of 1940 the Rumanian river fleet consisted of 25 passenger vessels, 95 tugs and 544 lighter and motor freight vessels with a carrying capacity of nearly half a million tons, and 69 tank lighters and motor tankers with a carrying capacity of 40,000 tons. The share of river traffic in total annual sea and river traffic increased from 46 percent in 1937 to 88 percent in 1941 (Stockholm Cable, 10 September 1943). In the first half of 1943 river navigation accounted for 14.7 million tons of freight as against 9.5 million tons in the first six months of 1942.

It is known that efforts were made to replace motor ships and oil burning vessels by coal burning steamers and tugs. With freight tonnage increasing as indicated above, however, all available river ships must have been used intensively. Estimated oil requirements, which include the consumption for all international shipping on the Danube, have been increased by 5 percent as compared with 1942. It may be mentioned that the bulk of the requirements consist of fuel oil, as most of the Danubian ships burn fuel oil. The British Hartley report of November 1943 allocates nearly exclusively gas oil to Danube shipping in contrast with the Hartley report of November 1941.

Agriculture

Mechanization of agriculture has made rapid progress even during the war. The number of tractors increased from 3,296 in 1940 to 8,250 in October 1943 (Deutsche Bergwerks Zeitung, 22 October 1943). Appreciable quantities of oil were also needed for the occupied areas. It is suggested that 1943 estimates of agricultural requirements be increased by 25 percent over those in 1942.

Industry

According to a decree of February 1943 all oil burners had to be converted to the use of solid fuels by September 1943. Reportedly, the date was later postponed to November 1944 (Bern Cable, 16 December 1943). Industries in Bucharest will have to use natural gas and elsewhere coal will be used. In the meantime, refineries were allowed to supply special fuel oil only within the quotas fixed by the Ministry of Commerce and Mining (Oel und Kohle, 1 May 1943). A similar decree had already been issued in April 1942 requesting the completion of conversion of industrial installations to coal by April 1943 (see OSS

1942 study on civilian consumption). However, lack of equipment and the scarcity of alternative fuels had delayed the execution of this program. It was reported that conversions had not really started before May 1943 (Bern Cable, 25 May 1943).

The construction of new natural gas pipelines to Bucharest and elsewhere, the increase in the imports and production of coal, and the savings of oil achieved by greater economy in its use may have reduced industrial fuel oil requirements during 1943 by 75,000 tons as against 1942 (see also Bern Cable, 16 October 1943, 3 November 1943, and 24 November 1943, Oel und Kohle, 1 August 1943, and many other sources not quoted here). With the completion of several new pipelines now under construction further appreciable savings can be expected. The Sonametan Company, which holds a distribution monopoly for methane gas, increased its sales in 1942 over 1941 by as much as 17 percent or to about 1,545 million cubic meters (Bern Cable, 31 August 1943); 82 percent of its sales went to industry (about 18 percent was used in households) (Oel und Kohle, 1 September 1943).

Household

Efforts were made to replace kerosene wherever possible but during 1943 large quantities were still needed for heating purposes. Early in 1943 it was reported that kerosene was rationed at 4 liters per person per month (British Enemy Oil Intelligence Committee, 10 May 1943).

VII. INDUSTRIAL AND CIVILIAN CONSUMPTION OF LIQUID PETROLEUM PRODUCTS IN BULGARIA DURING 1943

(See Tables 11 and 12)

Overall Consumption

There is very little intelligence on the size of Bulgaria's present industrial and civilian oil requirements. It is very unlikely, however, that the total consumption of the country, including that of its newly acquired territories, should have fallen to 19,000 tons, the figure estimated by the British. As a matter of fact, more than 20,000 tons were allocated to agriculture in 1943 as against 16,000 tons in 1942 (Oel und Kohle, 8 March 1943 and Suedost Echo, 2 July 1943). Total petroleum consumption has been put at 45,000 tons, of which 8,000 tons may have been light motor fuel, 17,000 tons kerosene, 12,000 tons gas oil, 2,000 tons fuel oil and 6,000 tons lubricants.

Road Transportation

Increasingly severe restrictions had been imposed on road transportation during 1942 and further curtailments, especially for state-owned vehicles, were introduced in April 1943 (Nachrichten fuer den Aussenhandel 8 March 1942 and 20 April 1943). The total number of civilian vehicles in use early in 1943 has been estimated at 2,500 private cars (of which 400 were taxis), 600 buses (excluding 300 laid up), and 2,500 trucks (including substitute fuelled units). Rations for the private car of a doctor and for taxis were 20 liters, and for a bus 60-80 liters, probably per week (see British Enemy Oil Intelligence Committee, 2 May 1943, which, in our belief, underestimates Bulgarian civilian requirements; see also British Enemy Oil Intelligence Committee, 26 June 1943).

Railways

Reports indicate a severe shortage of lubricants (British

Enemy Oil Intelligence Committee, 15 March 1943). Estimates for the year have, however, been left at the low level of 1942.

Agriculture.

As mentioned above, over 20,000 tons of petroleum products were earmarked for agricultural purposes in 1943. The oil trade was asked to reserve, under the supervision of the Director of Civilian Mobilization, a certain percentage of all its imports for agriculture. Supplies were to be distributed according to the directives of the Bulgarian Bank for Agriculture and of cooperative societies. The quantities earmarked amounted to 700 tons of light motor fuel, 14,250 tons of kerosene, 1,200 tons of lubricants and 5,600 tons of gas oil (Oel und Kohle, 8 March 1943). Actual allocations were probably below this schedule. Greatest economy in the use of oil products for industrial purposes has been ordered by the government; supplies will only be made available for jobs of highest priority which could not be done without using oil (Oel und Kohle, 1 November 1943).

Industry and Household

Scarcity of kerosene has been reported from Sofia (British Enemy Oil Intelligence Committee, 1 March 1943) and estimates for household requirements have been reduced slightly.

VIII. INDUSTRIAL AND CIVILIAN CONSUMPTION OF LIQUID PETROLEUM PRODUCTS IN FINLAND DURING 1943

(See Tables 13 and 14)

Overall Consumption

Except for a small domestic alcohol production and an irrelevant output of wood tar (Deutsche Bergwerks Zeitung, 29 October 1943), Finland is completely dependent on supplies from Germany and to a minor extent from Rumania. Requirements have been estimated on the basis of the 1942 build up of consumption by uses, allowing for an intervening cut in consumption by about 15 percent. This rate of decline is similar to that applicable to Germany. Consumption of light motor fuel has been put at 25,000 tons, that of kerosene at 10,000 tons, that of lubricants at 11,000 tons, and that of gas oil at 4,000 tons, a total of 50,000 tons.

Road Transportation

The number of motor vehicles in use has been reduced to one-third or one-quarter of the prewar figure. Most of the private cars have been laid up while the bulk of the trucks use substitute fuels. Lack of liquid and solid fuels, together with the tire shortage, has been responsible for severe restrictions on truck transportation and taxi services (Oel und Kohle, 22 February 1943). Bus services have been cut to less than one-third of the prewar level (Nachrichten fuer den Aussenhandel, 14 August 1942). Total consumption of petroleum products for road transportation has thus been put at some 20 percent below the 1942 level.

Shipping

Petroleum supplies for fishing and important inland lake shipping was probably maintained at the 1942 level (British Enemy Oil Intelligence Committee, 18 October 1943).

Agriculture

By July 1943 only half the number of available tractors (3,000 out of 6,000) had been converted to the use of substitute fuels. In October 1943 it was stated (Oel und Kohle, 1 October 1943) that sufficient petroleum supplies were available to satisfy the most important agricultural fuel requirements.

Industry and Household

Supplies to industry were most likely considerably below the 1942 level.

Only very small rations of kerosene were available for household purposes. Carbide was increasingly used and imports of carbide have doubled (Oel und Kohle, 1 October 1943).

IX. INDUSTRIAL AND CIVILIAN CONSUMPTION OF LIQUID PETROLEUM PRODUCTS IN FRANCE DURING 1943

(See Tables 15 and 16)

Overall Consumption

At the beginning of 1943 it was reported that Germany promised to supply France with 10,000 tons of gasoline, 8,000 tons of gas oil, and 3,000 tons of lubricants a month, or a total of about 250,000 tons of petroleum products for the year (British Enemy Oil Intelligence Committee, 1 March 1943). No provisions were made for fuel oil imports.

According to intelligence believed to be authentic (British Enemy Oil Intelligence Committee, 6 December 1943), liquid fuel allocations to French uses were as follows during the months, April to August 1943:

LIQUID FUEL ALLOCATIONS TO FRENCH USES

(Quantities in tons)

	1943				
	April	May	June	July	August
Light Motor Fuel	12,715	10,190	8,416	7,926	8,330
Kerosene	817	817	813	695	718
Gas Oil	5,656	4,616	4,182	5,657	5,657
Fuel Oil	2,000	2,000	2,580	2,080	2,185
TOTAL	21,188	17,623	15,991	16,358	16,890

In addition, so it was reported by another source, about 2,000 tons of lubricating oils were imported monthly while another 2,000 tons of lubricating oil were obtained from domestic production and regeneration of used lubricants; of this total, synthetic anthrazenic oils account for 1,500 tons monthly (British Enemy Oil

Intelligence Committee, 9 August 1943) and regenerated lubricants for about 500 tons (Oel und Kohle, 1 October 1943). A mixture of 58 percent gasoline, 13 percent benzol, and 29 percent alcohol has been marketed since the middle of 1943 compared with a blend of 30 percent gasoline, 50 percent alcohol and 20 percent benzol used earlier in the year. Some 40,000 tons of alcohol and 15,000 tons of benzol were available locally as a motor fuel. Another 40,000 tons of tar oil were probably used as fuel oil. Finally, the small domestic synthetic gasoline production, the shale oil output at Autun, and the small crude oil production found in Southern France, may have accounted for another 30-40,000 tons. Making allowances for all quantities available from domestic production and for the trend of imports during the year (which was steeply downwards), consumption of light motor fuel in France has been estimated at 130,000 tons, that of kerosene at 10,000 tons, that of lubricants at 55,000 tons, that of gas oil at 60,000 tons, and that of fuel oil at 45,000 tons, or a total of 300,000 tons.

Road Transportation

Intelligence reports indicate that only very few vehicles still use liquid fuel; some doctors' cars, ambulances, busses and agricultural trucks run on petroleum (British Enemy Oil Intelligence Committee, 15 March 1943 and Oel und Kohle, 22 March 1943). At the beginning of the year it was stated that some 15,000 trucks used in agriculture would have to be converted from liquid to solid fuels.

Liquid fuel requirements for road transportation in 1943 have been estimated at 95,000 tons of motor fuel and 25,000 tons of Diesel oil.

Railways

According to official statistics the railway requirements of lubricants in 1942 amounted to 9,000 tons (Bern Cable, Number 6024). This rate of consumption was so low that mechanical troubles occurred constantly because of lack of lubrication. In the first 3 months of 1943 it was reported that lubricating oil supplies to the railways were even below the 1942 level and amounted to only 1,500 tons. For the whole of 1943 lubricating oil requirements have been estimated at 8,000 tons. Only minor quantities of other products were used by the railways.

Inland Shipping and Fishing

Consumption has been put about 30 percent below the 1942 level. In 1942 inland shipping transported about 50 percent of the tonnage of 1939 (Journal Marine Marchand, 17 and 24 December 1942); in 1943 the percentage rose probably to 60-70 percent. Efforts were made to transfer as much freight as possible from the railways to shipping (Bern Cable, 28 October 1943). The few reports available show that oil rations for inland ships were very small and that domestic tar oil was used in some instances (British Enemy Oil Intelligence Committee, 31 May 1943 and 30 August 1943).

Rations were still granted to fishermen as shown in the following table (British Enemy Oil Intelligence Committee, 30 August 1943):

MONTHLY RATIONS FOR FISHERMEN IN NORTHERN FRANCE

(in liters)

Gasoline Engines	Gasoline Ration	Diesel Engines	Diesel Oil Ration
under 10 h.p.	25	8-15 h.p.	75-100
10-12 h.p.	75-100	20-24 h.p.	200
25 h.p.	100-150	60 h.p.	500

At the beginning of each month the Inscription Maritime distributes supplies to the fishermen.

Agriculture

Agricultural petroleum requirements have been put one-third below the 1942 level to account for a reduction in total oil supplies and for a small increase in the number of substitute fuel using tractors. In July 1943 it was actually reported that oil rations for tractors amounted to about one-quarter of normal demand (British Enemy Oil Intelligence Committee, 26 June 1943). It was recently stated that a very light agricultural tractor, based on the chassis of an ordinary private car, has been placed on the market to save fuel (Stockholm Cable, 7 October 1943).

Industry

Industrial lubricating oil consumption has been cut most severely. Nearly half of the total requirements have been supplied from domestic lubricating oil production. Further substantial progress in the domestic output of lubricants is expected in 1944. (According to Oel und Kohle, 1 November 1943, it is planned to cover 93 percent

of total consumption from domestic products in 1944.) Regeneration of used lubricants also contributed important quantities of lubricants to the available supplies. As a matter of fact, rations for new lubricants were only granted if 40 percent of the rations was handed back as used oil for regeneration. Early in 1943 it was estimated that only some 20,000 tons of lubricants would be available to industry in 1943 (British Enemy Oil Intelligence Committee, 10 May 1943).

Industrial fuel oil has been replaced to a limited extent by coal tar distillates (Bern Cable, 29 September 1943).

Household

Because of the shortage of gas and electricity, exceedingly small kerosene rations of one-fourth of a liter per household per month were granted for lighting private apartments (Bern Cable, September 1943).

X. INDUSTRIAL AND CIVILIAN CONSUMPTION OF LIQUID PETROLEUM PRODUCTS IN BELGIUM DURING 1943

(See Tables 17 and 18)

Overall Consumption

Total industrial and civilian consumption of petroleum in 1943 has been estimated on the basis of actual oil supplies and their allocation to the various uses in Belgium for the early months of 1943 (British Enemy Oil Intelligence Committee, 26 June 1943, 11 October 1943, 22 November 1943, and other sources). Consumption of motor fuel (including 70-90 percent benzol) has been put at 25,000 tons, kerosene at 1,000 tons, lubricants at 16,000 tons, gas oil (which frequently consisted of a 60 percent gas oil and 40 percent coal tar oil mixture, or of gas oil mixed with 70 percent gasoline, British Enemy Oil Intelligence Committee, 5 May 1943 and 26 June 1943) at 31,000 tons, and fuel oil at 9,000 tons (including domestic tar oil).

Road Transportation

Estimates for liquid fuel requirements for road transportation have been reduced by about 25 percent as compared with 1942. A reduction of the number of vehicles in use and progress in the conversion to substitute fuels were responsible for this cut. Moreover, the rations for vehicles not yet converted were reduced continuously and preference was given to small powered units (British Enemy Oil Intelligence Committee, 1 October 1943).

Lubricating oil rations amounted to 1 liter of lubricants per 40-50 liters of gasoline and for substitute fuel using vehicles to 1 liter of lubricants per 40-50 kilometers performed (British Enemy Oil Intelligence Committee, 3 July 1943).

Railways

In spite of the decline in freight transportation (Bern Cable, 5 October 1943), estimates for requirements have been left at the low 1942 level.

Inland Shipping

1943 estimates for the oil requirements of the 900 motor vessels and 200 tugs available in Belgium (Ministry of Economic Warfare, Weekly Intelligence Notes, April 1943) have been reduced by about 20 percent as compared with 1942. Intelligence indicates that barges were frequently laid up for lack of oil. Fishing too is severely handicapped by an oil shortage.

Agriculture and Industry

No change is suggested in the estimate for agriculture.

The shortage of industrial lubricants in 1943 is even more severe than in 1942. It was reported that industries were allowed not much more than 15 percent of their pre-war requirements. A German Office for Oil Regeneration was set up; all used lubricants had to be collected and regenerated.

Tar oils have replaced fuel oil in industry. In 1941 34,000 tons of tar oil were actually consumed in industry; however, tar oil has become increasingly scarce and city gas has been used in some industries.

Household

Kerosene rations have been issued to households without gas or electricity. In February 1943 the size of the rations was 4 liters per household.

XI. INDUSTRIAL AND CIVILIAN CONSUMPTION OF LIQUID PETROLEUM PRODUCTS IN HOLLAND DURING 1943

(See Tables 19 and 20)

Overall Consumption

In the first four months of 1943 about 4,500 tons of gasoline, 5,000 tons of gas oil, and 3,200 tons of kerosene were made available for Dutch consumption. The size of the allocations for industrial and civilian uses has been declining continuously, however, and in each of the first 4 months consumption exceeded imports, so that withdrawals from the meager stocks were necessary (British Enemy Oil Intelligence Committee, 10 May 1943). Consumption for the whole of 1943 was, therefore, probably well below three times the figure given above. Requirements in 1943 have been estimated at 10,000 tons of gasoline, 8,000 tons of kerosene, and 20,000 tons of gas oil (including some domestic tar oils). Lubricating oil consumption corresponded to about 25 percent of pre-war demand or to some 15,000 tons (OSS Cable). Some fuel oil was most likely obtained from the domestic production of tar oil; its consumption is estimated at 5,000 tons. Total estimated Dutch requirements in 1943 amount thus to about 58,000 tons.

Road Transportation

On the basis of actual allocations during the early months of 1943 it has been estimated that about 6,000 tons of light motor fuel were used in road transportation. Allocations to Dutch uses were seriously curtailed and practically no supplies were made available even for doctors, food distribution, and other vital services. The number of motor vehicles in use early in 1943 and in 1938 is shown in the following table:

NUMBER OF MOTOR VEHICLES IN USE IN HOLLAND

	1943			1938
		Running on:		
	Total	Liquid fuel	Substitutes	
Motorcycles	3,000	3,000	-	60,000
Private Cars	16,000	8,000	8,000	94,000
Busses	1,800	.....	.....	4,100
Trucks	16,000	4,000	12,000	51,000
TOTAL	36,800	15,000	20,000	209,100

Railways

No change is suggested in the estimate of lubricating oil requirements as compared with 1942.

Inland and Coastal Shipping and Fishing

Consumption of petroleum by inland shipping, so it is reported, amounted to only a fraction of the peace time requirements. Because of the scarcity of petroleum motor barges were frequently used as dumb barges behind tugs (British Enemy Oil Intelligence Committee, 27 September 1943).

Rations for the fishing fleet were still granted in 1943. Some reports state, however, that the rations were just sufficient for 3 days at sea a month(British Enemy Oil Intelligence Committee, 10 May 1943).

On the whole, consumption for inland and coastal shipping and fishing has been reduced by 50 percent as compared with the 1942 figures.

Agriculture

It was reported in July (De Standaard, 15 July 1943) that

no liquid fuel rations could be expected for the threshing of the crop and that substitute sources of power would have to be used. Lubricating oil supplies were also very scarce (Nieuwe Rotterdamsche Courant, 27 August 1943). Estimated 1943 requirements have been reduced by about 30 percent as compared with 1942.

Industry and Household

Lubricating oil supplies were reported down to 25 percent of normal demand.

Kerosene consumption for cooking was reported to have been cut to 10 percent of pre-war demand and for lighting to 3.7 percent.

XII. INDUSTRIAL AND CIVILIAN CONSUMPTION OF LIQUID PETROLEUM PRODUCTS IN DENMARK DURING 1943

(See Tables 21 and 22)

Overall Consumption

According to official Danish statistics (Statistiske Efterretninger of September 1943) gasoline consumption in the first quarter of 1943 was 2,300 tons, and in the second quarter 1,700 tons. For the whole year light motor fuel consumption has been estimated at 8,000 tons. Kerosene consumption has been put at 10,000 tons and the use of gas and fuel oil (including some oil extracted from peat) at 36,000 tons. Lubricating oil supplies were reported to be exceedingly tight (British Enemy Oil Intelligence Committee, 10 July 1943) and 1943 consumption has been estimated at 10,000 tons. A very small part of this total may have been obtained from peat tar (see Stockholm Cable, 13 August 1943).

Road Transportation

Motor fuel supplies for taxis, busses and trucks were further cut in 1943. Only very minor quantities of gasoline were allocated to doctors, to the police, and to ARP and fire services (British Enemy Oil Intelligence Committee, 25 January 1943). By October 1943 all rations for taxis had been stopped (Politiken, 22 October 1943 and Svenska Dagbladet, 8 October 1943), but small rations were still granted to doctors (Soroe Amtstidende, 8 October 1943). Liquid fuel rations for starting up generator vehicles were withdrawn early in the year (British Enemy Oil Intelligence Committee, 1 February 1943. The estimate of the petroleum requirements for road transportation have been reduced by 50 percent as compared with the 1942 figures.

Railways and Inland Shipping and Fishing

No change is suggested in the 1942 estimates of the lubricating oil requirements of the Danish railways.

About 23,000 tons of petroleum products have been allocated to shipping and fishing. A large number of sailing vessels with auxiliary motors were used for coastal shipping and for trading with Germany. Larger Diesel vessels, so it was reported, were often laid up.

Agriculture

Severe cuts in kerosene rations for chicken farms, hothouses, and for agricultural machines were made in 1943. No liquid fuel rations were to be granted to tractors which could be converted to substitute fuels (Landbrugsindets Meddeleser, September 1943). It may be mentioned that in the summer of 1942 the Agricultural Department estimated that 6,000 tons of kerosene, 4,000 tons of gas oil, 160 tons of gasoline, and 600 tons of other products were needed for harvesting. Available supplies in 1943 were most likely short of the needs and probably amounted to about 75 percent of the 1942 demand.

Industry

Lubricating oil consumption was severely cut in 1943 as stocks were exhausted (British Enemy Oil Intelligence Committee, 5 October 1943). Industrial use of black oils was also curtailed (see Boersen, 19 June 1943). Consumption was probably not more than half the 1942 figure.

Household

Monthly kerosene rations for households with no other means of cooking and lighting amounted to 5 liters per household plus $2\frac{1}{2}$ liters

for each member of the household over 15 years of age until August 1943 (Stockholm Cable, 3 July 1943). In August the ration was reduced to 4½ liters for each household plus 1 liter for each member (Soroe Amtstidende, 26 August 1943). At that time it was also indicated that it was uncertain whether rations could be maintained even at this level. The total household requirements for 1943 have therefore been estimated 30 percent below the 1942 level.

XIII. INDUSTRIAL AND CIVILIAN CONSUMPTION OF LIQUID PETROLEUM PRODUCTS IN NORWAY DURING 1943

(See Tables 23 and 24)

Overall Consumption

Industrial and civilian consumption of petroleum products in Norway during 1942 has been reported as follows (British Enemy Oil Intelligence Committee, 30 August 1943):

ESTIMATED SALES OF PETROLEUM PRODUCTS IN NORWAY DURING 1942

(in metric tons)

Motor fuel	38,000
Kerosene	11,000
Lubricants	7,000
Diesel oil	3,000
Fuel oil	76,000
TOTAL	135,000

These figures exceed the 1942 OSS estimates by over 80,000 tons. However, the OSS 1942 figure for Norway did not include any Axis bunker requirements. The figures quoted above probably include fuel oil used for shipping between Norway and Germany and probably also the requirements of the German Civil Administration in Norway and some transit shipments to Finland.

The transit oil shipments to Finland, and the bunker consumption of German merchant ships in Norway probably amounted to not less than 50,000 tons in 1942. This would leave some 85,000 tons of petroleum products for Norwegian industrial and civilian consumption in 1942.

Statistics available for the first three months of 1943 indicate an annual rate of consumption of 25,000 tons of gasoline and 80,000 tons of black products excluding army uses but probably including German bunkers and transit shipments to Finland. Subtracting all but Norwegian industrial and civilian uses and allowing for a small 1943 domestic production of about 5,000 tons of wood tar oils, peat oil, and sulphite alcohol (see Chemische Technik, April 1943, and Samaalenes Amtstidende, 11 September 1943) and allowing for a decline in imports in the latter months of the year, Norwegian civilian and industrial requirements in 1943 may be estimated as follows: 15,000 tons of motor fuels, 7,000 tons of kerosene, 8,000 tons of lubricants, 15,000 tons of Diesel oil, and 25,000 tons of fuel oil, or a total of 70,000 tons.

Road Transportation

Early in 1943 the following number of road vehicles were still in use in Norway:

NUMBER OF ROAD VEHICLES IN USE IN NORWAY EARLY IN 1943

	Running on:						
	Gasoline	Diesel Oil	Wood	Charcoal	Carbide	Other	Total
Motorcycles	590	-	-	-	10	132	732
Private cars and taxis	2,827	2	1,295	830	537	9	5,500
Busses	886	190	1,367	91	1	11	2,546
Trucks and special vehicles	13,121	228	7,814	1,081	1,163	48	23,455
GRAND TOTAL	17,424	420	10,476	2,002	1,711	200	32,233
Of which used by:							
Germans							5,572
Norwegians							26,661

There were thus nearly 18,000 oil using vehicles left. By the middle of the year the number was probably reduced to 15,000. Restrictions on the use of road transportation became more and more severe (British Enemy Oil Intelligence Committee, 1 and 15 March 1943), and long distance road transportation was prohibited wherever other modes of transportation were available (Aftenposten, 14 September 1943). Total requirements for road transportation in 1943 have been estimated at about 12,000 tons.

Railways

No change is suggested in the 1942 estimates.

Coastal Shipping and Fishing

The largest oil consumer in the country was the fishing industry. During the 12 months period, October 1940 to September 1941, fishermen received about 35,000 tons of heavy oils, or about 35 percent of their peace time requirements. Since that time rations have been considerably reduced. In some instances, they were made dependent on the size of the catch delivered to the Germans (e.g., 6 liters of fuel oil per 1,000 kilograms of fish in Tromsoe). Actual consumption of heavy oil for fishing in 1943 is estimated at two-thirds of the 1941 supplies, or at about 25,000 tons. Another 10,000 tons were probably needed for coastal shipping. Since in Germany gas oil was frequently blended with light motor fuel (British Enemy Oil Intelligence Committee, 5 April 1943), it has been assumed that one-quarter of these gas oil requirements were actually light motor fuel.

Agriculture

Allocations to agriculture have probably also declined somewhat as compared with 1942. The pressure exercised on farmers --

though hitherto with no great success -- to convert their tractors to substitute fuels has been ever increasing.

Industry

In January 1943 the German Commissar for Norway informed all owners of industrial plants using Diesel or fuel oil that as from 1 April 1943 no further rations would be made available for industrial uses. Other sources of power would have to be employed, such as electricity, coal, coke, wood, gas generators, and furnace gas. In cases where conversion was impossible, a statement giving the reasons had to be filed with the Ministry before 10 March 1943 (British Enemy Oil Intelligence Committee, 28 July 1943).

Lubricating oil rations for industry were also cut, as is evidenced by frequent references to the lubricating oil scarcity in the press.

Estimates of the oil requirements of Norwegian industry have therefore been put below the 1942 level.

Household

Estimates of the kerosene consumption for essential heating, cooking, and lighting purposes in 1943 have been put slightly below the 1942 figure.

XIV. INDUSTRIAL AND CIVILIAN CONSUMPTION OF LIQUID PETROLEUM PRODUCTS IN THE BALTIC STATES DURING 1943

(See Tables 25 and 26)

Overall Consumption

Estonia, Latvia, Lithuania, and White Russia form the new German administrative unit of "Ostland." In general, it may be assumed that the regulations on petroleum consumption are the same for the three Baltic countries. Though Estonia's shale oil industry would be sufficient to cover a large part of the requirements of the three Baltic States, only a fraction of this production is allocated to domestic uses. Germany controls the output and requisitions most of it for naval use in the Baltic.

Domestic consumption of petroleum products is thus subject to very severe restrictions (Revaler Zeitung, 30 September 1943). Liquid fuels may be used only for military and other vital purposes and then only with the utmost economy. Total consumption in the Baltic States in 1943 has been put at 20 percent of the pre-war level. Requirements would thus amount to a total of 41,000 tons of which 12,000 tons may have been light motor fuel (including alcohol), 8,000 tons kerosene, 4,000 tons lubricants, 4,000 tons gas oil, and 13,000 tons fuel oil.

Available intelligence on the use of oil in the various branches of the economy refers, in most cases, to Estonia only. Conditions in the other two countries were probably very similar to that prevailing in Estonia.

Road Transportation and Railways

Since March 1943 motor traffic has been subject to most

severe restrictions. A record of each journey has been required, showing its purpose and length (Oel und Kohle, 22 March 1943). Severe warnings have been published in the papers agains unnecessary driving (Vilnaer Zeitung, 19 August 1943). Statistics available for Lithuania show that highway transportation under German traffic management in August 1943 needed an estimated 350 tons of petroleum (see Bern Cable, 16 November 1943). On the basis of a similar rate of consumption for the other Baltic States, petroleum requirements for road transportation in 1943 have been put at 10,000 tons.

The requirements of the Estonian railways, which use large quantities of fuel oil produced from domestic shale oil, have been put at 40 percent of 1938 consumption.

Agriculture

Oil supplies to agriculture have also been cut severely. An increasing number of tractors has been converted to substitute fuels. In Estonia nearly 900 tractors use solid fuel (British Enemy Oil Intelligence Committee, 3 July 1943). Total petroleum requirements for agricultural use in all Baltic States is put at 5,000 tons.

Industry

Very small quantities of oil products were used in industry. Including lubricants, requirements may have totalled 8,000 tons.

Household

A mixture (called "Alka") of alcohol (85 percent) and kerosene (15 percent) from Estonia's shale oil output was introduced early in 1943 (Deutsche Zeitung fuer das Ostland, 16 December 1942). "Alka" is supposed to be very economical in use, but explodes very easily. It is distributed only to those farmers who have loyally fulfilled

their production program. Special lamps were to be manufactured for the use of this oil. Total household consumption of petroleum products in the Baltic States in 1943 is put at 6,000 tons.

XV. INDUSTRIAL AND CIVILIAN CONSUMPTION OF LIQUID PETROLEUM PRODUCTS IN THE GENERAL GOVERNMENT OF POLAND DURING 1943

(See Tables 27 and 28)

Overall Consumption

The General Government includes 18 million persons and 150,000 square kilometers of Poland's former population of 32 million persons and area of 390,000 square kilometers (Wirtschaftsdienst, 2 January 1942). The pre-war petroleum consumption of the area of the General Government has been tentatively estimated at 150,000 tons out of total Polish pre-war requirements of 387,000 tons (see also Oel und Kohle, 15 July 1942 where pre-war consumption is given as 100,000 tons only). The petrolem consumption of German Poland and Danzig (given separately by MEW) is included in our estimates for Germany, as the intelligence on which the 1943 OSS (and MEW) estimate for the Reich is based refers to Germany as defined by her present boundaries. The OSS estimate for 1942 ignored this fact.

The 1943 requirements for the General Government have been put at 55,000 tons, a cut from pre-war demand by the same percentage as that applicable to Germany. Some 19,000 tons may have been gasoline, 16,000 tons kerosene, 9,000 tons lubricants, 5,000 tons gas oil, and 6,000 tons fuel oil. The figure does not, of course, include refinery fuel oil consumption, which as in the case of all other countries with a refinery industry has already been subtracted from the estimates of total supplies of finished products from crude oil refining.

Road Transportation

Polish road traffic was reorganized by the Germans and great efforts were made to improve road conditions. Some trucks were imported from Germany. A Road Traffic Corporation with its seat in

Cracow was created and put in charge of all road traffic (Krakauer Zeitung, 4 October 1943). This reorganization was an essential prerequisite for the exploitation of Poland and for the maintenance of supply lines to the Eastern Front through Poland. New postal services were also established which in 1942 had some 1,000 motor vehicles at their disposal (Krakauer Zeitung, 27 August 1942). Early in 1943 a considerable proportion of the vehicles used in essential industries were reported to be still using liquid motor fuels (British Enemy Oil Intelligence Committee, 18 January 1943, and 12 April 1943). However, passenger car traffic was practically non-existent. Special permits were needed for long distance motor transport. Total 1943 requirements of petroleum products for road transportation have been put at 16,000 tons.

Agriculture

The program for the conversion of tractors to substitute fuels has probably not yet led to a material reduction of liquid fuel requirements. Total agricultural consumption has been put at 10,000 tons.

Industry

Natural gas has replaced fuel oil in many industries. Total requirements of petroleum products have been put at 15,000 tons.

Household

The consumption of kerosene, which, because of the lack of gas and electricity, was essential in wide parts of the country, has been put at 12,000 tons.

XVI. INDUSTRIAL AND CIVILIAN CONSUMPTION OF LIQUID PETROLEUM PRODUCTS IN OCCUPIED RUSSIA DURING 1943

CONFIDENTIAL

(See Tables 29 and 30)

Overall Consumption

Up to the Russian summer campaign of 1943, Occupied Russia had been divided administratively into the Reichskommissariat Ostland (Estonia, Latvia and Lithuania — dealt with under the Baltic States — and White Russia) and the Reichskommisariat Ukraine (including the districts of Shitomir, Kiev, Nikolajev, Dnjepropetrowsk, Wolhynien, and the Crimea). The areas east of these districts were under the administration of the German theater commander (Neues Wiener Tagblatt, 17 April 1943). The Russian campaign in the summer and winter of 1943 reduced the size of Occupied Russia by one-third to one-half and restored to Russia many of the above named districts.

Estimated pre-war (1940) petroleum requirements of the areas occupied as of July 1943 (excluding the Baltic States and Eastern Poland) may be estimated at about 6 million tons, broken down by uses as follows (see OSS study, R & A Number 58, "The Effect of Territorial Losses on Russian Petroleum Position"):

ESTIMATED PRE-WAR CONSUMPTION OF OCCUPIED RUSSIA

(thousand metric tons)

	1940
Commercial vehicles	300
Railroads	760
Shipping	160
Agriculture	1,380
Mining and manufacturing	1,380
Other industries	320
Household, heating, and lighting	1,080
TOTAL	5,960

Total allocations of petroleum products to Occupied Russia in 1943 have been put at the low figure of 300,000 tons or 5 percent of the 1940 estimate. It has been assumed that only minor quantities of petroleum products were allocated to industry, mining and manufacturing, railroads, and home heating and lighting. Practically all the oil using industrial machinery and locomotives were evacuated or destroyed by the Russians. The machines, motors, and locomotives brought in by the Germans were equipped wherever feasible to the use of other fuels than oil. Most of the estimated petroleum needs originated in agriculture and road transportation.

Since the autumn of 1943 supplies, distribution, and rationing of petroleum products for Occupied Russia has been centralized in the "Oil Department East" of the "Reichsstelle fuer Mineraloele" (Oel und Kohle, 15 September 1943). This reorganization was obviously undertaken in an effort to keep overall requirements in line with supplies and to reduce allocations for war vital uses to the lowest possible level (Deutsche Bergwerks Zeitung, 28 September 1943). The new department was obviously designated to take over the policy making functions of the "Mineraloelstelle Ukraine" which had been created early in 1943 (Oel und Kohle, 1 May 1943). The latter organization kept the administrative functions over the supplies allocated to the Ukraine.

Road Transportation

A minimum amount of road traffic has been established by the German Administration. The postal authorities maintain a skeleton service. A special organization, the "Strassentransportleistung Ost" with several local offices, has been created for truck transportation (Essener National Zeitung, 14 January 1942). It has been reported that Germany

sent some 5,000 trucks to the Ukraine by the middle of 1943. Including trucks sent to White Russia and repaired Russian trucks, the total number of available oil using trucks may have amounted to 20,000. Total road transportation requirements of motor fuel may be put at 30,000 tons.

Agriculture

By the middle of 1943 Germany had, according to reliable intelligence, supplied 1,000 tractors, 1,500 plows and 1,000 threshing machines to the Ukraine. Another 5,000 generator tractors were supplied to Northern and Central Russia (Neue Zuercher Zeitung, 15 January 1943), compared with planned imports of as many as 20,000 tractors. In addition, some 30,000 damaged Russian tractors had been repaired (N S Landpost, 17 July 1942). Assuming that 10,000 of these repaired tractors were converted to substitute fuels (to wood in Northern and Central Russia and to natural gas in the Ukraine), some 20,000 tractors may have been using petroleum.

Oil supplies to agriculture were nearly exclusively limited to those quantities necessary for harvesting and threshing. Scarcely any petroleum was allocated for cultivation and rural transportation (Muenchener Neueste Nachrichten, 24 December 1942). The annual consumption per tractor was probably 4 tons or about 40 percent of the Russian pre-war rate. Total agricultural consumption in 1943 has been put at 90,000 tons of motor fuel and tractor kerosene and 5,000 tons of lubricants.

Industry

A nominal figure of 75,000 tons of petroleum products has been allocated to industrial uses, mainly for mining and to a minor extent for manufacturing industries.

Railway, shipping, and household

No change is suggested in the estimates for railways, shipping and household as compared with the figure given in the 1942 study.

XVII. INDUSTRIAL AND CIVILIAN CONSUMPTION OF LIQUID PETROLEUM PRODUCTS IN SERBIA AND CROATIA DURING 1943

(See Tables 31 and 32)

Overall Consumption

The kingdom of Yugoslavia has been broken up into the puppet states of Serbia, under German military occupation, and Croatia, under Italian rule until September 1943. Certain other parts of the country were incorporated into or administered by Germany, Italy, Hungary, Bulgaria, and Albania. No official figures are available for the pre-war requirements of either Serbia and Croatia as at present defined; but they may tentatively be estimated at 130,000 tons. Petroleum consumption of the two puppet states in 1943 has been estimated at a total of 35,000 tons or at only 25 percent of peace time requirements. An estimated 8,000 tons were light motor fuel, 6,000 tons kerosene, 6,000 tons lubricants, 8,000 tons gas oil, and 7,000 tons fuel oil. Except for a small domestic production of crude oil in Croatia and a small alcohol production in both States, requirements were covered by imports from Rumania.

Road Transportation

Statistics on the number of motor vehicles in use early in 1941 shortly before the country was invaded are available and are presented herewith:

NUMBER OF MOTOR VEHICLES IN USE IN YUGOSLAVIA

	1941
Motorcycles	11,643
Private cars	15,886
Busses	968
Trucks	5,331
TOTAL	33,828

Particularly intensive use was made of Diesel vehicles, as these accounted for 564 busses, and 3,869 trucks (OSS report, 2 October 1943). There is only scanty intelligence available on the development of motor traffic since 1941.

In July 1943 it was reported from Serbia that private cars of over 2.5 liters cylinder capacity would receive no more liquid fuel (British Enemy Oil Intelligence Committee, 16 August 1943). Lighter cars used for vital purposes probably continued to receive small rations. In Croatia all ration cards were re-examined in January 1943 (British Enemy Oil Intelligence Committee, 8 March 1943). New ration cards were supplied only for military and sanitary services (Oel und Kohle, 22 February 1943).

Since August 1942 the motor fuel used in Croatia has consisted of 89 percent gasoline, 10 percent ethyl alcohol, and 1 percent methanol, as against 76 percent gasoline, 20 percent alcohol and 4 percent methanol between October 1941 and August 1942 (see Oel und Kohle, 22 August 1942).

Total consumption of petroleum products for road transportation in Serbia and Croatia in 1943 has been put at 13,000 tons.

Household and Other Uses

Scarcely any intelligence is available on the use of liquid fuel in the other branches of the economy. It is known that some rations were still granted to agriculture because it has been reported that applications for such rations must be made two months in advance (Svenska Morgenbladet, 30 September 1943). For household purposes, one liter of kerosene per person was granted in Croatia in August, half a liter in September, and three-quarters of a liter in November

and December (Deutsche Zeitung in Kroatien, 5 August 1943, 21 September 1943, and 9 November 1943).

XVIII. INDUSTRIAL AND CIVILIAN CONSUMPTION OF LIQUID PETROLEUM PRODUCTS IN GREECE DURING 1943

(See Tables 33 and 34)

Overall Consumption

According to a statement in the Deutsche Zeitung in Kroatien of 5 May 1943, the following quantities of petroleum products were supplied to civilian uses in Greece during the first quarter of 1943.

ALLOCATIONS OF PETROLEUM FOR CIVILIAN USES IN GREECE

(in metric tons)

	January to March 1943
Gasoline	2,000
Kerosene	1,000
Black oils	5,000
TOTAL	8,000

This total actually exceeds the imports during the first 5 months of 1942 when 1,404 tons of gasoline and 6,506 tons of black products were imported (Nachrichten fuer den Aussenhandel, 16 September 1942). It is thus more than likely that oil imports into Greece during the remaining three-quarters of the year have not been maintained at the level of the first quarter. Annual consumption, including some domestic supplies of vegetable oils, has been estimated at 30,000 tons. Some 6,000 tons may have been light motor fuel, 3,000 tons kerosene, 4,000 tons lubricants, 10,000 tons gas oil, and 7,000 tons fuel oil.

Road Transportation

Early in 1943 motor fuel rations for Greek post office vans, busses and public utilities were severely curtailed (British

Enemy Oil Intelligence Committee, 21 June 1943). Great efforts were made to increase the use of substitute fuels even though local supplies of such fuels were limited. Consumption of petroleum products for road transportation in 1943 has been put at 6,000 tons.

Shipping

Shipping was seriously Hampered by lack of oil. Many motor caiques were immobilized (British Enemy Oil Intelligence Committee, 7 May 1943). Total consumption under this heading has been put at 9,000 tons.

Agriculture

Consumption of agriculture per season was estimated in 1942 at 6,200 tons of Diesel oil and 300 tons of motor fuel (Oel und Kohle, 8 September 1942). Total consumption in 1943 has been put at 7,000 tons.

Industry and Household

Only minor quantities of oil were available for industry and household.